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Abstract: Background: In Switzerland, basic health insurance is mandatory for all inhabitants, but a rising number of insured have arrears in premium payments, potentially leading to coverage suspension. We aimed at characterizing insured with debt enforcement proceedings with respect to socio-demographic and health utilization aspects. Methods: Cross-sectional analysis of 508.000 insured with basic health insurance contracts in 2013, of whom 14,000 (2.8%) with debt enforcement proceedings, from 11 Swiss cantons. Groups were characterized using logistic regression and latent class analysis. Results: Insured with debt enforcement proceedings were more likely to be young, male and without dependents (partner, kids). Having no supplementary insurance and receiving partial premium subsidies was associated with an increased debt enforcement proceedings risk. Within the debt enforcement proceedings group, three subgroups were identified: 60% were young and seemingly healthy, with a below-average fraction of premium subsidy recipients (18%) and low out-of-pocket payments in prior year (median Swiss Francs 0). Two groups consisted of relatively ill elderly persons (22%, 99% of whom with chronic illnesses) or families (18%), many of whom (29% and 51%) were recipients of premium subsidies. Median out-of-pocket payments in the prior year were high (Swiss Francs 625 and 688, respectively). Conclusions: Sixty percent of premium arrears derive from young insured without apparent financial problems; 40% are owed by elderly and families, which are potentially hurt by coverage loss.

DOI: <https://doi.org/10.1016/j.pmedr.2015.02.001>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-116975>

Journal Article

Published Version



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Originally published at:

von Wyl, Viktor; Beck, Konstantin (2015). Failure to pay for social health insurance premiums: Acts of protest or desperation? Preventive medicine reports, 2:127-133.

DOI: <https://doi.org/10.1016/j.pmedr.2015.02.001>



Failure to pay for social health insurance premiums: Acts of protest or desperation?

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ARTICLE INFO

Available online 7 February 2015

Keywords:

Social health insurance
Switzerland
Solidarity
Chronic diseases
Bankruptcy
Universal access to medical care

ABSTRACT

Background. In Switzerland, basic health insurance is mandatory for all inhabitants, but a rising number of insured have arrears in premium payments, potentially leading to coverage suspension. We aimed at characterizing insured with debt enforcement proceedings with respect to socio-demographic and health utilization aspects.

Methods. Cross-sectional analysis of 508,000 insured with basic health insurance contracts in 2013, of whom 14,000 (2.8%) with debt enforcement proceedings, from 11 Swiss cantons. Groups were characterized using logistic regression and latent class analysis.

Results. Insured with debt enforcement proceedings were more likely to be young, male and without dependents (partner, kids). Having no supplementary insurance and receiving partial premium subsidies was associated with an increased debt enforcement proceedings risk.

Within the debt enforcement proceedings group, three subgroups were identified: 60% were young and seemingly healthy, with a below-average fraction of premium subsidy recipients (18%) and low out-of-pocket payments in prior year (median Swiss Francs 0).

Two groups consisted of relatively ill elderly persons (22%, 99% of whom with chronic illnesses) or families (18%), many of whom (29% and 51%) were recipients of premium subsidies. Median out-of-pocket payments in the prior year were high (Swiss Francs 625 and 688, respectively).

Conclusions. Sixty percent of premium arrears derive from young insured without apparent financial problems; 40% are owed by elderly and families, which are potentially hurt by coverage loss.

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Introduction

For statutory health insurance, Switzerland has opted for a social insurance system (Enthoven, 1978), which is characterized by mandatory enrollment into health plans, fixed and comprehensive coverage of drugs and treatments, and community-rated insurance premiums (Thomson et al., 2013). Furthermore, income-dependent premium subsidies are available for individuals in need. Those subsidies should ensure universal access to care, which, according to the latest OECD country assessment, has been widely achieved in Switzerland (Organisation for Economic Co-operation and Development, 2011).

Some authors have pointed out that access to care may not entirely be universal in Switzerland, however. Around 40% of all health care expenditures of CHF 65 billion in 2012 are carried by households, thereby

leaving Swiss insured with the highest out-of-pocket payments for health care of all OECD countries (OECD Health Data, 2013). It is well known that high deductibles and co-payments can be a hindrance for access to care, and surveys have shown that foregoing medical care for economic reasons is quite prevalent in Switzerland (Guessous et al., 2012; Wolff et al., 2011) and elsewhere (Wharam et al., 2007; Galbraith et al., 2012). For example, the long-running Commonwealth Foundation survey queries randomly selected inhabitants from 11 resource-rich countries (including Switzerland) on various aspects of health care financing and access to care (Schoen et al., 2010). In this survey, 10% of Swiss respondents reported not having sought a doctor or not having refilled a drug prescription for financial reasons. This percentage was somewhat higher than in The Netherlands (6%) – with a comparable health care system – and the UK (5%), but lower than, for example, in Germany (25%) and the USA (33%). Surveys from the Swiss canton of Geneva yielded a similar prevalence of foregone health care (14%), which predominantly concerned dental care (75%), but also specialist care (33%) and general practitioner appointments (15%) (Guessous et al., 2012; Wolff et al., 2011). The Geneva study further revealed that foregoing health care was – at least partially – driven by

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disposable income, with more frequent reports of foregone health care utilization in low-income strata. Furthermore, the Commonwealth Fund survey discovered that individuals suffering from chronic conditions (asthma or chronic lung problems, cancer, diabetes, or heart disease) were also more frequently experiencing financial barriers to care than healthy respondents in Switzerland (18% of chronically ill vs. 13% of healthy individuals) (Schoen et al., 2013). This finding is particularly disconcerting because delayed or foregone health care can exacerbate chronic illnesses (Heisler et al., 2004).

Failure to pay for mandatory health insurance premiums can also lead to limitations in access to care (c.f. (Crivelli, 2005; Crivelli, 2010)). In 2006, the Swiss parliament responded to a rising volume of outstanding social health insurance premium bills with a legislation change that allowed health insurers to suspend insurance coverage (except for emergency treatment) until payment of all premium debts. Subsequently, the number of individuals with coverage suspension rose sharply from 89,000 in 2006 to almost 147,000 insured in 2010, which corresponds to 1.9% of all Swiss inhabitants (Bundesamt für Gesundheit, 2013). An additional 363,000 to 421,000 insured were faced with at least one debt enforcement request for outstanding insurance premiums, which is the initial step towards insolvency and asset seizure. The sanctions for late premium payments were intended to deter free-riding, especially by young and healthy individuals with sufficient income, but it soon turned out that they also hurt many insured with financial problems. For example, of all insured with coverage suspension during spring 2009 in the canton of Ticino, 30% had limited financial means and received premium subsidies (Crivelli, 2010). Those and other observations triggered the parliament to revise the law in 2009. Effective since January 2012, health insurers are no longer allowed to suspend coverage autonomously. Instead, they must report late premium payers to cantonal authorities, and after initiation of debt collection proceedings insurers are reimbursed 85% of the outstanding debt by the cantons in return for maintaining health coverage. Coverage suspension is still possible, but it must be initiated by cantons after due consideration of an insured's circumstances of living (for instance, insurance coverage cannot be suspended for children or persons on welfare). As of 2014, 9 cantons have established "black lists" of insured with suspended coverage (which are accessible by health care providers), but the effectiveness of this measure is debated.

Little is known about the reasons for non-payment of health insurance premiums in Switzerland. Given the possible implications of insurance coverage suspension – particularly for ill individuals – this knowledge gap is quite astounding. This cross-sectional study aimed at characterizing the population of insured with debt enforcement proceedings due to outstanding health insurance premium bills. Secondly, we performed an ecological analysis in which we explored how the risk for missed premium payments is linked with household premium burden and age (after adjustment for family status).

Methods

Setting

Purchase of a basic insurance with standardized, comprehensive coverage is required for all persons living in Switzerland. A minimum deductible of CHF 300 (1 CHF = 1 USD or 0.833 EUR; EUR 245) and co-payments of 10% up to a ceiling of CHF 700 (EUR 573) are mandatory for all for insured > 18 years, whereas children have no deductible and co-payments are capped at half of the amount for adults.

Health insurance premiums are community-rated, but premium reductions can be granted to children (mandatory), young adults (at insurer's discretion) and for higher voluntary deductibles (ranging from CHF 500 [EUR 409] to CHF 2500 [EUR 2045] annually) or limitation of physician/provider choice (voluntary gatekeeping and/or managed care).

Premium subsidies are available to individuals in need based on taxable income. Each canton has implemented its own subsidy system with different eligibility criteria. Currently, 30% of all insured benefit from subsidies, with higher fractions among young insured aged 25 or less and individuals aged 86 and above (Bundesamt für Gesundheit, 2013). Assessments of the subsidy system have attested to its effectiveness to keep the premium burden below a pre-specified level, but these reports also criticized that the growth of subsidy funds has not kept pace with insurance premium increases (Kägi et al., 2012). Furthermore, several cantons are discussing or have implemented additional restrictions to subsidy access for economic reasons.

Debt enforcement proceedings for health insurance premiums are governed by the Swiss Health Insurance Act. In case of missed premium payments, after at least one warning letter insurers can start debt enforcement proceedings with cantonal authorities. If the bills remain unpaid, the insurer can initiate asset seizure. If the liquidation of assets does not generate enough funds to cover the unpaid bills, the insurer will receive 85% of the outstanding debt from the canton in return for maintenance of full insurance coverage for the indebted insured. However, cantons are allowed to sanction those debtors by limiting their coverage to emergency treatment (i.e., by placing them on "black lists", which can be viewed by health care providers).

Data

Anonymized data was provided by CSS insurance, which is the largest social health insurer in Switzerland with a market share of 16%. This insurer's population of enrollees tends to be somewhat older and more ill than the average Swiss population, but is otherwise very representative. Our study included insured with a mandatory health insurance contract for the year 2013 (one year after the change in law forbidding autonomous coverage suspension by insurers).

We only considered insured from eleven cantons in which premium subsidies were handled by insurers (as opposed to direct subsidy payment to insured), and hence for which subsidy data were available from the insurer. As a limitation for generalization, while all language regions and both urban and rural cantons were represented in this sample, the regions of Central and Eastern Switzerland could not be included. Only one of these eleven cantons (Ticino) had implemented a "black list" by 2013.

The insurer data contained information on socio-demographic factors (age, sex, family status, place of living, eligibility for premium subsidies), chosen insurance coverage (deductible level, supplementary insurance coverage), medical information (presence of chronic illnesses as defined by pharmaceutical cost groups (Lamers and van Vliet, 2004), amount of reimbursed and out-of-pocket medical expenditures in past year, hospitalizations in past year), and timing of debt enforcement proceedings. Data on household income distributions were obtained from the Swiss Household Budget Survey 2006–2009 (Haushaltsbudgeterhebung (HABE)). Analyses were performed at the level of "payers" for insurance premiums (e.g., parents paying for children).

Statistical analysis

Payers of social insurance premiums were grouped into those with and those without debt enforcement proceedings (control group) in 2013. Those groups were compared with respect to socio-demographic, economic, and medical characteristics (see above) using univariable and multivariable logistic regression. The multivariable model was constructed by adding all variables with a likelihood ratio p-value < 0.2 in the univariable regression to the multivariable regression (one variable at a time). Confounding, effect modifications, and co-linearity of variables were assessed case-by-case on the basis of effect-size changes. The final model was restricted to variables with a p-value < 0.05 by

the likelihood ratio test for the multivariable regression and important confounder variables.

In addition, latent class analysis was employed to identify distinct subgroups among payers with debt enforcement proceedings based on age, sex, family status, eligibility for premium subsidies, medical expenditures in 2012 (grouped by quintile), and the presence of chronic illnesses. The optimal number of subgroups was determined by comparison of the Aikake Information Criterion and the Bayesian Information Criterion.

Data on premium burdens came from the Swiss Household Budget Survey, which collects information on household income and expenditures (e.g., for social health insurance or medical care). The premium burden was calculated for each household in the survey sample as the household's costs for social health insurance premiums, divided by the reported disposable household income. Next, a prediction model for premium burden was constructed on the basis of family status (5 categories), age groups (6 categories), and cantons (or regions in case of small cantons, 9 categories) by use of linear regression. This prediction model was then applied to all payers from the insurance sample to estimate their premium burden in terms of income share. Likewise, a predicted risk for debt enforcement proceedings was estimated for each payer in the insurance data on the basis of the final multivariable logistic regression model (see above).

Finally, those two predicted variables (premium burden and debt enforcement risk) were analyzed by a third regression model to obtain marginal effects of debt enforcement risk changes given a 1%-point change in premium burden, adjusted for age and family status. These marginal effect estimations were performed by use of a generalized linear model for proportions, weighed by the number of individuals per stratum and by use of robust error variance (Papke and Wooldridge, 1996).

All analyses were performed with Stata 12.1 (Stata Corp., College Station TX, USA) and with R (www.r-project.org) using the polCA package.

Sensitivity analysis

Individuals with debt enforcement proceedings may seem healthier (in terms of absent or low health care utilization) because they may have already lost their coverage before 2013 or may be forgoing care because of co-payments. In order to investigate this potential bias, we repeated all analyses on a subset of premium payers who also held a basic health insurance contract in 2012 and who had not already been exposed to debt foreclosure in the years 2011 and 2012. This selection resulted in a smaller data set of 431,234 individuals (of whom 9049 with debt enforcement proceedings in 2013), which tended to be older and more ill when compared with the sample used in the main analysis (see online appendix, Table 1). However, the results from the sensitivity analysis (including group classifications from latent class analysis) were very similar to those from the main analysis, and therefore our conclusions were not altered (see online appendix, Table 2).

Results

Identification of factors associated with debt enforcement for social health insurance premiums

For this study, 507,975 recipients of premium bills from 11 cantons were analyzed, of whom 14,179 (2.8%) with debt enforcement proceedings due to unpaid mandatory health insurance premiums in 2013. A comparison of payers with debt enforcement with the control group is displayed in Table 1. The group with debt enforcement was younger, more often male, and more frequently consisted of single person households without a partner or children than the control group. They (and their family members) also seemed healthier than their control counterparts: 32% of payers and their associated family members of the

debt enforcement group had filled drug prescriptions that are specific for a chronic illness, as opposed to 47% among controls. Likewise, the amount of medical expenditures in 2012 was lower (median CHF 350) when compared with controls (median CHF 1634).

Interestingly, eligibility for income-dependent premium subsidies was similar between the two groups (25% vs 22.5% among controls), but differences were registered with respect to supplementary insurance coverage. In 2012, 74% of the control group, but only 25% of the group with debt enforcement, had supplementary coverage. Furthermore, around one quarter (26.3%) of the debt enforcement group, but only a small minority of the control group, had already had debt enforcement proceedings in 2012.

Many of the descriptive findings were confirmed by the multivariable logistic regression analysis (Table 2, third column). Additionally, the regression analysis revealed that family status was an important risk factor: compared with single persons (reference), single persons with dependent kids had a higher risk for debt enforcement (odds ratio [OR], 2.1 [95% confidence interval 1.9; 2.2]). Furthermore, the association of debt enforcement with eligibility for premium subsidies was not monotonic but depended on the percentage of premiums covered by subsidies. Receiving $\geq 2/3$ of owed premiums as subsidy was associated with a reduced risk (OR, 0.5 [0.4; 0.5]) for debt enforcement; lower subsidy amounts led to an increase (OR, 1.2 [1.2; 1.3] for both categories). Not having supplementary insurance was a strong predictor for debt enforcement (OR, 6.3 [6.1; 6.6]), suggesting either limited financial means or a lack of need. Interestingly, low out-of-pocket expenditures were also positively associated with debt enforcement risk (OR 1.6 [1.5; 1.7] and 1.2 [1.1; 1.2] for the two smallest quintiles).

Identification of subgroups among debtors

We further explored whether the group of payers with debt enforcement may consist of distinct subgroups by use of latent class analysis. This method yielded three subgroups (Table 3). The largest subgroup 1 containing 60% of all payers with debt enforcement mainly consisted of young, predominantly male, single persons. Only few had had health expenditures or an in-patient hospital stay in 2012, and only a small percentage had drug prescriptions for a chronic illness. Further interesting, the proportion of recipients of premium subsidies (16%) was below the average of the control group (23%).

The second-largest payer group 2 (22%) mainly consisted of older, single persons with high health care expenditures and who were frequently ill (97% with chronic diseases, 16% with hospitalizations in 2012). Of further note, eligibility for premium subsidies was slightly higher than in the control group, but almost 3 out of 4 payers had no supplementary insurance coverage.

The third subgroup (18%) had comparatively high health care expenditures in 2012, and relatively few had supplementary insurance coverage. This group seemed to consist predominantly of families with children, and 53% of these households received premium subsidies.

Additional results from sensitivity analysis

The observation of overall lower health care expenditures for insured with debt enforcement proceedings (Table 1) may be owing to earlier coverage loss or (in settings with high out-of-pocket expenditures) to foregone health care due to financial problems. The sensitivity analysis sample offered an opportunity to look at changes of health care utilization patterns before and after debt enforcement proceedings. To this end, within-individual changes of annual health care expenditures between 2012 and 2013 were compared across the three latent class groups and the control group (online appendix, Table 2). Interestingly, comparisons of averages (standard deviations) suggested increases in annual health care expenditures for group 1 [CHF 233 (3320)], group 2 [CHF 258 (11,735)] and the control group [CHF 342 (10,000)]

(all p-values for hypothesis of an expenditure decrease by one sample t -test >0.8 ; also see online appendix, Table 2 and online appendix, Fig. 1 for group-specific medians and interquartile ranges). Only group 3 [CHF – 554 (8152)] showed evidence for a reduction of health care utilization (p-value for expenditure decrease by one-sample t -test = 0.0024). Overall, these analyses are consistent with the hypothesis of intrinsically low health care consumption among the group of young insured with debt enforcement proceedings (group 1), although longer observation periods would be needed to fully rule out an effect of foregone health care.

Ecologic study: Is the risk for debt enforcement correlated with levels of premium burden?

Next, we explored how the probability for debt enforcement proceedings was associated with the premium burden, thereby exploiting the variability of premium levels across different cantons. Table 4 displays regression results for six age groups, which were structured so as to fit those used by the household budget survey, and adjusted for family status. As expected, the risk change per 1%-point premium increase was positive across all age groups. In other words, within each age group regions with higher premium levels also tended to show higher rates of debt foreclosure proceedings. (See Fig. 1.) Yet the magnitude of this effect was dependent on the payer's age. Table 4 suggests that the lower the age the greater the risk change for debt enforcement per 1%-point higher premium burden.

Discussion

This analysis of a representative sample of Swiss inhabitants revealed that failure to pay for social health insurance premiums (and subsequent initiation of debt enforcement proceedings) is a multifactorial problem. The population of insured with debt enforcement proceedings can be classified into three quite homogenous groups. The largest fraction (60%) consists of predominantly young, seemingly healthy insured. Only 15% of those individuals are eligible for premium subsidies, and they have the smallest average premium burden (as estimated from data of the Swiss household budget survey). Yet, the data are inconclusive with respect to potential motives for not paying the premiums. The income-related information imply that this group may have had ample financial means to pay for premiums, hence indeed pointing towards negligence or protest. Alternatively, it is possible that these young insured did not have enough funds to cover premiums but failed to apply for or were not considered eligible for premium subsidies. A lack of knowledge about the Swiss health care system may also be a possible explanation (Rossini and Fischer, 2012). But, given the low health

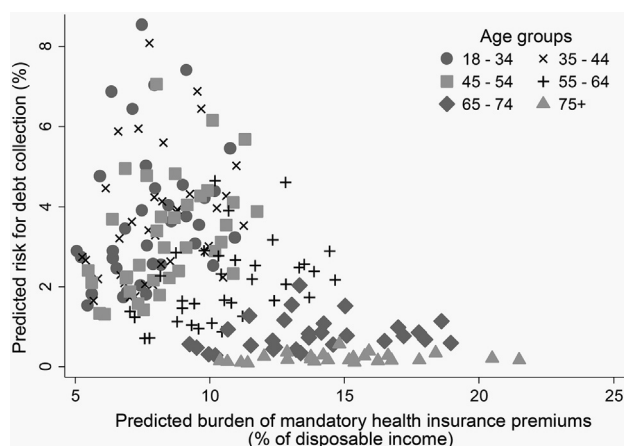


Fig. 1. Scatter plot of average premium burden in 2013 with estimated risk for debt enforcement proceedings, stratified by age group.

Table 1

Baseline characteristics of Swiss insured with and without debt enforcement proceedings (control group). Note that several variables were collected in 2012, because they may have already been influenced by debt enforcement proceedings in 2013 (e.g., reimbursement stop for medical expenditures or loss of supplementary insurance coverage). Numbers are numbers of individuals and column percent unless stated otherwise.

Payer characteristics	Control group	Group with debt enforcement proceedings
N	493,796 (100%)	14,179 (100%)
Median age [IQR]	50 [36; 66]	41 [31; 51]
Male sex	268,790 (54.4%)	9379 (66.1%)
Nationality		
Swiss	348,644 (70.6%)	8142 (57.4%)
Other	81,404 (16.5%)	4287 (30.2%)
Unknown	63,748 (12.9%)	1750 (12.3%)
Family status		
Single adult, no kids	343,883 (69.6%)	10,755 (75.9%)
Single adult with kids	42,094 (8.5%)	1557 (11.0%)
Couple with kids	48,817 (9.9%)	1085 (7.7%)
Couple, no kids	52,802 (10.7%)	586 (4.1%)
Other	6200 (1.3%)	196 (1.4%)
Chosen deductible (CHF per year)		
300 (default)	219,503 (44.5%)	7644 (53.9%)
500	82,168 (16.6%)	2381 (16.8%)
1000	18,147 (3.7%)	593 (4.2%)
1500	73,365 (14.9%)	1854 (13.1%)
2000	19,808 (4.0%)	313 (2.2%)
2500	80,805 (16.4%)	1394 (9.8%)
Had an inpatient hospital or nursing home stay of 3 days or more in 2012	50,044 (10.1%)	900 (6.3%)
Suffers from at least one chronic illness	232,566 (47.1%)	4479 (31.6%)
Type of chronic illness (pharmaceutical cost group)		
Malignancies, Cancer	21,935 (4.4%)	225 (1.6%)
Diabetes Type 2	32,310 (6.5%)	621 (4.5%)
HIV	2066 (0.4%)	116 (0.8%)
Renal disease, end stage renal disease	2871 (0.6%)	41 (0.3%)
High cholesterol and hypertension	60,234 (12.2%)	658 (4.6%)
Glaucoma	30,267 (6.1%)	160 (1.1%)
Diseases of the thyroid gland	26,899 (5.4%)	333 (2.3%)
Osteoporosis	17,720 (3.6%)	64 (0.5%)
Migraine	8450 (1.7%)	191 (1.3%)
Respiratory illnesses, Asthma, COPD	47,384 (9.6%)	1037 (7.3%)
Depression	71,174 (14.4%)	1644 (11.6%)
Chronic psychosis	9199 (1.9%)	176 (1.2%)
Dependency (alcohol/heroin)	4925 (1.0%)	256 (1.8%)
Alzheimer's disease	3304 (0.7%)	12 (0.1%)
Neuropathic pain	7260 (1.5%)	146 (1.0%)
Epilepsy	10,738 (2.2%)	228 (1.6%)
Rheumatologic conditions	46,266 (9.4%)	470 (3.3%)
Cardiac diseases	28,390 (5.7%)	249 (1.8%)
Crohn's disease and ulcerative colitis	6177 (1.3%)	78 (0.6%)
Acid peptic disease	89,249 (18.1%)	1525 (10.8%)
Insulin-dependent Diabetes	6476 (1.3%)	161 (1.1%)
Parkinson's disease	4940 (1.0%)	34 (0.2%)
Transplantations	1028 (0.2%)	22 (0.2%)
Receives no premium subsidies	382,897 (77.5%)	10,638 (75.0%)
Tertiles of premium subsidies (for those who are eligible)		
Subsidies cover between 1% and 27% of premium costs	36,716 (7.4%)	1431 (10.1%)
Subsidies cover between 28% and 68% of premium costs	36,762 (7.4%)	1385 (9.8%)
Subsidies cover more than 69% of premium costs	37,421 (7.6%)	725 (5.1%)
Has no supplementary insurance ^a	123,407 (25.0%)	9814 (69.2%)
Had supplementary insurance in 2012	366,006 (74.1%)	3559 (25.1%)
Already had a debt foreclosure in 2012	144 (0.0%)	3736 (26.3%)
Median health care expenditures in 2012 [IQR]	1634 [107; 5426]	350 [0; 2559]
Had no health care expenditures in 2012	109,238 (22.1%)	5111 (36.0%)
Quartiles of health care expenditures in 2012 (for those with costs >0)		
Between CHF 1 and CHF 816	85,508 (17.3%)	3334 (23.5%)
Between CHF 817 and CHF 2637	99,353 (20.1%)	2242 (15.8%)
Between CHF 2638 and CHF 6915	99,720 (20.2%)	1876 (13.2%)
More than CHF 6916	99,977 (20.2%)	1616 (11.4%)

Table 1 (continued)

Payer characteristics	Control group	Group with debt enforcement proceedings
Median of total out-of-pocket expenditures in 2012 [IQR]	544 [74; 1030]	260 [0; 655]
Had no out-of-pocket-payments in 2012	109,647 (22.2%)	5125 (36.1%)
Quartiles of out-of-pocket payments in 2012		
Between CHF 1 and CHF 384	84,961 (17.2%)	3459 (24.4%)
Between CHF 385 and CHF 708	99,292 (20.1%)	2317 (16.3%)
Between CHF 709 and CHF 1165	99,883 (20.2%)	1783 (12.6%)
Between CHF 1166 and CHF 11,275	100,013 (20.3%)	1495 (10.5%)

^a This variable describes individuals who had no private insurance in 2012 and 2013, excluding those who lost private insurance coverage due to unpaid private insurance premiums.

care utilization patterns seen in this group, the conclusion is straightforward that those young insured may be the ones who suffer least from a possible suspension of coverage.

The two remaining subgroups (40%) of persons with debt enforcement proceedings mainly consisted of ill, elderly individuals or families with children. Both subgroups had greater than average health care expenditures, and the proportion of individuals with premium subsidies was also larger than in the control population. Further noteworthy, as opposed to the majority of individuals from the control group, comparatively few individuals of subgroups 2 and 3 had supplementary insurance coverage, which may also be a sign for limited income. Given their previous record of health care utilization and the abundance of chronic illnesses in these two subgroups, it is likely that the failure to pay for premiums reflects a financial crisis. Sanctioning these individuals by a coverage suspension may be counterproductive because many of them are dependent on regular medical care and treatment. Furthermore, it is well documented that foregone medical care for chronic illnesses may lead to even more costly emergency interventions (Kullgren et al., 2010; Wharam et al., 2007).

Our observations are in line with the (to our knowledge) only other existing Swiss investigation into reasons for premium payment arrears (cited in (Crivelli, 2010)). This report describes a population of insured with insurance coverage suspension from the canton of Ticino and was based on data from 2009 (i.e., before the legislation change). Similar to our study, young age, being single and receiving premiums subsidies were identified as risk factors for coverage suspension. This study further noted that a staggering 83% of these insured had already faced debt enforcement proceedings previously (other than for premium arrears) and that 75% had been subject to coverage suspension for 18 months or longer at study baseline. Our analysis extends those findings by covering a larger geographical area and by identification of distinct sub-groups among insured with premium payment arrears.

Despite the availability of premium subsidies, the Swiss mode of social health insurance financing by community-rating is known to be regressive, meaning that individuals with lower incomes have to spend a much higher share for premiums (Bilger, 2008; Crivelli and Salari, 2012). Furthermore, because of steep annual premium increases (average 4% per year), the premium burden is increasingly considered to reach unbearable levels in the eye of the public. Indeed, up to 43% of all respondents in a representative, long-running survey reported occasional or permanent problems in paying for premiums (Longchamp et al., 2012) (a finding that was also confirmed by international surveys (Schoen et al., 2010; Schoen et al., 2013)). A switch to an income-dependent premium system has been suggested to improve equity in health finance, but repeatedly failed to gain enough votes in popular referenda (e.g., (Perneger and Hudelson, 2005)). Furthermore, the support for the status quo system currently still seems to be strong (Jannot and Perneger, 2014; Longchamp et al., 2012). Interestingly, a preference for the current regional flat-fee system over an income dependent system even prevails among Swiss physicians (Jannot and Perneger, 2014).

Table 2

Logistic regression analysis of factors associated with debt enforcement proceedings for Swiss insured in 2013.

Payer characteristics	Univariable model; odds ratio [95% CI]	Multivariable model; odds ratio [95% CI]
Age, per year increase	0.84 [0.84; 0.85]	0.88 [0.87; 0.88]
Male sex	1.64 [1.58; 1.69]	1.75 [1.68; 1.81]
Nationality		
Swiss	1	1
Other	2.26 [2.17; 2.34]	1.24 [1.19; 1.30]
Unknown	1.18 [1.12; 1.24]	2.01 [1.89; 2.12]
Family status		
Single adult, no kids	1	1
Single adult with kids	1.18 [1.12; 1.25]	2.05 [1.93; 2.18]
Couple with kids	0.71 [0.67; 0.76]	1.02 [0.95; 1.09]
Couple, no kids	0.35 [0.33; 0.39]	0.58 [0.53; 0.64]
Other	1.01 [0.88; 1.17]	0.73 [0.63; 0.85]
Has high deductible of CHF 1000 or more	1.54 [1.48; 1.59]	
Had an inpatient hospital or nursing home stay of 3 days or more in 2012	0.60 [0.56; 0.64]	
Suffers from at least one chronic illness	0.52 [0.50; 0.54]	1.15 [1.10; 1.21]
Type of chronic illness (pharmaceutical cost group)		
Malignancies	0.35 [0.30; 0.40]	
Diabetes Type 2	0.68 [0.62; 0.73]	
HIV	1.96 [1.63; 2.37]	
Renal disease, end stage renal disease	0.50 [0.36; 0.68]	
High cholesterol and hypertension	0.35 [0.32; 0.38]	
Glaucoma	0.17 [0.15; 0.20]	
Diseases of the thyroid gland	0.42 [0.37; 0.47]	
Osteoporosis	0.12 [0.10; 0.16]	
Migraine	0.78 [0.68; 0.91]	
Respiratory illnesses, Asthma, COPD	0.74 [0.70; 0.79]	
Depression	0.78 [0.74; 0.82]	
Chronic psychosis	0.66 [0.57; 0.77]	
Dependency (alcohol/heroin)	1.83 [1.61; 2.07]	
Alzheimer's disease	0.13 [0.07; 0.22]	
Neuropathic pain	0.70 [0.59; 0.82]	
Epilepsy	0.74 [0.64; 0.84]	
Rheumatologic conditions	0.33 [0.30; 0.36]	
Cardiac diseases	0.29 [0.26; 0.33]	
Acid peptic disease	0.44 [0.35; 0.55]	
Crohn's disease and ulcerative colitis	0.55 [0.52; 0.58]	
Insulin-dependent diabetes	0.86 [0.74; 1.01]	
Parkinson's disease	0.24 [0.17; 0.33]	
Transplantations	0.74 [0.49; 1.14]	
Receives no premium subsidies	1	1
Subsidies cover between 1% and 27% of premium costs	1.40 [1.33; 1.48]	1.24 [1.17; 1.32]
Subsidies cover between 28% and 68% of premium costs	1.36 [1.28; 1.44]	1.22 [1.15; 1.30]
Subsidies cover more than 69% of premium costs	0.70 [0.65; 0.75]	0.46 [0.42; 0.49]
Has no supplementary insurance ^a	6.75 [6.51; 7.00]	6.30 [6.05; 6.56]
Had no health care expenditures in 2012	1	
Between CHF 1 and CHF 816	0.83 [0.80; 0.87]	
Between CHF 817 and CHF 2637	0.48 [0.46; 0.51]	
Between CHF 2638 and CHF 6915	0.40 [0.38; 0.42]	
More than CHF 6916	0.35 [0.33; 0.37]	
Had no out-of-pocket-payment in 2012s	1	1
Between CHF 1 and CHF 384	0.87 [0.83; 0.91]	1.57 [1.49; 1.65]
Between CHF 385 and CHF 708	0.50 [0.47; 0.52]	1.17 [1.11; 1.24]
Between CHF 709 and CHF 1165	0.38 [0.36; 0.40]	0.97 [0.91; 1.04]
Between CHF 1166 and CHF 11,275	0.32 [0.30; 0.34]	0.93 [0.87; 1.00]

^a This variable describes individuals who had no private insurance in 2012 and 2013, excluding those who lost private insurance coverage due to unpaid private insurance premiums.

This study has strengths and limitations. The analysis builds upon a study population that is representative for Switzerland and has benefited from detailed (but anonymized) access to information on premium payments and debt enforcement, which are usually not available for research. Unfortunately, only limited information on households' financial situations were directly available from the insurer. To mitigate this problem we imputed average household incomes from a second data

Table 3
Subgroups of Swiss individuals with debt enforcement proceedings in 2013 as identified by latent class analysis. Numbers are number of individuals and column percent unless stated otherwise.

	Group 1	Group 2	Group 3	No debt enforcement
N	8071 (100%)	2959 (100%)	2398 (100%)	459,047 (100%)
Median age [IQR]	36 [28; 48]	51 [39; 60]	42 [34; 48]	50 [36; 66]
Male sex	5960 (73.8%)	1818 (61.4%)	1074 (44.8%)	248,566 (54.1%)
Nationality				
Swiss	4529 (56.1%)	1838 (62.1%)	1335 (55.7%)	321,516 (70.0%)
Other	2641 (32.7%)	596 (20.1%)	853 (35.6%)	77,673 (16.9%)
Unknown	901 (11.2%)	525 (17.7%)	210 (8.8%)	59,858 (13.0%)
Family status				
Single adult, no kids	7506 (93.0%)	2666 (90.1%)	23 (1.0%)	320,652 (69.9%)
Single adult with kids	210 (2.6%)	6 (0.2%)	1285 (53.6%)	39,720 (8.7%)
Couple with kids	105 (1.3%)	16 (0.5%)	893 (37.2%)	44,937 (9.8%)
Couple, no kids	223 (2.8%)	271 (9.2%)	38 (1.6%)	47,846 (10.4%)
Other	27 (0.3%)	0 (0%)	159 (6.6%)	5892 (1.3%)
Suffers from at least one chronic illness	138 (1.7%)	2957 (99.9%)	1187 (49.5%)	216,447 (47.2%)
Had an inpatient hospital or nursing home stay of 3 days or more in 2012	151 (1.9%)	423 (14.3%)	280 (11.7%)	46,423 (10.1%)
Median health care expenditures in 2012 [IQR]	0 [0; 446]	2670 [594; 7193]	2952 [1079; 7196]	1640 [107; 5446]
Median of total out-of-pocket expenditures in 2012 [IQR]	0 [0; 319]	625 [348; 1018]	688 [352; 1181]	544 [75; 1030]
Low deductible ≤ CHF 500	5037 (62.4%)	2589 (87.5%)	1842 (76.8%)	281,300 (61.3%)
Recipient of premium subsidies	1439 (17.8%)	853 (28.8%)	1232 (51.4%)	110,790 (24.1%)
Estimate of premium burden (Median % of disposable income [IQR])	6.9 [5.9; 7.6]	7.5 [6.4; 8.7]	8.5 [7.5; 9.7]	7.7 [6.4; 10.3]
Has no supplementary insurance ^a	5748 (71.2%)	2207 (74.6%)	1299 (54.2%)	112,498 (24.5%)

^a This variable describes individuals who had no private insurance in 2012 and 2013, excluding those who lost private insurance coverage due to unpaid private insurance premiums.

set. While such imputations are naturally not very precise, we believe that the conclusions derived from this procedure are robust, because our findings are in line with other Swiss studies (Gardioli et al., 2013). Subsequently, this premium burden information was correlated with predicted debt foreclosure risks, which suggests that age groups respond differently to higher premium burden. In particular, the largest debt foreclosure risk increases per 1%-point higher premium burden were observed among younger insured. Similar age-dependent dynamics are, for example, known from studies that investigate reasons for insurance carrier switches (Frank and Lamiraud, 2009). Although the results from the ecological analysis seem plausible, they are prone to many biases, and further confirmation through other studies is needed. Moreover, the cross-sectional study design and the lack of detailed longitudinal data also have to be considered limitations for the interpretation of our results. It is important to note that all findings merely represent associations, and that no causal relationships can be inferred from this study.

Two important conclusions emerge from this analysis. First, it seems important that equity of health financing would be enhanced by strengthening the subsidy system, which is an integral part of the Swiss health system to guarantee universal access to care. Second, the data imply that coverage suspension for non-payment of premiums may be harmful to a substantial group of individuals with health problems. By the same token, such sanctions are likely to have little effect on the majority of individuals with debt foreclosure proceedings because they are young and appear to have low levels of health care

utilization. Further investigations into the motives and economic circumstances for non-payment of social health insurance premiums would aid to design more effective measures for improvement of solidarity without harming vulnerable populations.

Conflicts of interest

Viktor von Wyl and Konstantin Beck were employees of CSS Insurance at the time of study conduct. The employer had no influence on study design, execution of analysis, manuscript drafting or decision to publish.

Acknowledgments

The authors wish to thank the Swiss Federal Office of Statistics for provision of the Household Budget Survey Data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.pmedr.2015.02.001>.

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Table 4

Ecological analysis of premium burden (share of premiums on income) and risk for debt enforcement proceedings. The table shows average marginal effects of a 1%-point change in premium burden on the percent risk for debt enforcement proceedings, by age group.

Age group	N	Average Marginal Effects (%-point change in risk per %-point change in premium burden)	[95% confidence interval]
18–34	114,676	1.435	[1.428; 1.442]
35–44	80,280	1.013	[1.007; 1.020]
45–54	90,688	0.944	[0.939; 0.950]
55–64	70,759	0.554	[0.550; 0.557]
65–74	58,237	0.175	[0.173; 0.177]
75 +	57,396	0.042	[0.042; 0.043]

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